INFLUENCE OF CANOPY ON MUST AND WINE QUALITY IN THE ZWEIGELT VARIETY

INFLUENȚA COVORULUI VEGETAL AL BUTUCILOR ASUPRA CALITĂȚII MUSTULUI ŞI VINULUI LA SOIUL ZWEIGELT

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Abstract. *The investigation was carried out in 2006, at the Ampelographic Collection of The Horticulture Faculty from Iasi, on the red wine variety Zweigelt. We have studied the influence of the total foliage area, the canopy thickness and the foliage exposure at the direct solar radiation, on the yield quality. After the determination of must and wine quality, the correlations between the canopy parameters and the yield quality were established. It was found that the total foliage area was positively correlated with the sugars content from must, alcohol content from wine, total extract and total acidity. The anthocyans content from grapes and wine is diminishing once with the increase in the canopy thickness, and the decrease in foliage exposure at direct solar radiation. Our investigations have established that the variation of canopy parameters affected the anthocyanic profile, and the chromatic characteristics of the red wines.*

Rezumat. *Cercetările au fost efectuate în anul 2006, în Colecția Ampelografică a Facultății de Horticultură din Iaşi, la soiul pentru vinuri roşii de calitate Zweigelt. S-a studiat influența pe care o exercită suprafața foliară totală, îndesirea covorului vegetal şi gradul de expunere a aparatului foliar la radiație solară directă, asupra calității producției. S-au efectuat determinări privind caracteristicile mustului şi vinului şi s-au stabilit corelațiile dintre parametrii covorului vegetal şi calitatea producției. S-a constatat că suprafața foliară totală se corelează pozitiv cu concentrația mustului în zaharuri, tăria alcoolică a vinului, extractul sec total şi aciditatea titrabilă. Conținutul de antociani din struguri şi vin, se diminuează odată cu îndesirea covorului vegetal al butucilor şi umbrirea aparatului foliar. Din cercetările efectuate a reieşit faptul că variația parametrilor covorului vegetal influențează profilul antocianic şi caracteristicile cromatice ale vinurilor roşii.*

INTRODUCTION

The latest investigations carried out on guiding systems in vine show that the foliage exposure to direct solar radiation is the main factor, on which greatly depend both the accumulation of sugars, anthocyans and aromatic compounds into grapes and the level of must total acidity.

Starting from this assessment, many wine-growing countries have elaborated guidance systems with two vegetation plans, which ensure the success of red wine variety growing in viticultural areas with limited heliothermal resources.

The growth of leaf area exposed to direct solar radiation favours the anthocyan accumulation and diminution in must total acidity (*Schneider, 1989; Zufferey şi Murisier, 2005; Murisier, 2006*). The must concentration in sugars is less influenced; this parameter of yield quality depends on the size of total leaf area and grape yield.

The canopy thickness, expressed by IF leaf index (Schneider, 1989), has negatively influenced the accumulation of anthocyans into grapes, and determined the increase in must acidity.

Investigations had as aim to determine correlations between canopy parameters and must and wine quality in Zweigelt variety, under conditions of Wine-Growing Centre of Copou, from Iaşi vineyard.

MATERIALS AND METHODS

Experiments were set up at the Ampelographic Collection of the Horticulture Faculty from Iaşi. The biological material was represented by the Zweigelt red wine variety, grafted on SO_4 stock - Crăciunel 4 clone. The plantation with planting distances of 2.2/1.2 m and denseness of 3737 vinestocks/ha, is situated on a 12% slope land, at S-W exposure. The vine guiding shape is semi-high, in bilateral cordon with two trunks, and pruning is done in short fruit-bearing links (knot of 2 buds + vine shoot of 4-5 buds). The training system, vertical monoplane trellis, ensures a foliage exposure area of 2.61 m^2/m of row.

Three experimental variants were established, having the same number of inflorescences/vinestock and a different number of shoots:

- variant V_1, with 10 shoots and 15 inflorescences/stem;
- variant V_2, with 15 shoots and 15 inflorescences/stem;
- varianta V_3, with 20 shoots and 15 inflorescences/stem.

Determinations carried out: *total leaf area, leaf area exposed at direct solar radiation, leaf index, must concentration in sugars, anthocyan content from grapes, must total acidity, wine alcoholic power, titrable acidity, anthocyan content from wine and total dry extract.*

RESULTS AND DISCUSSIONS

1. Analysis of canopy parameters. The increase in shoot number/vinestock determined an increase in *total leaf area*: V_1 = 1.81 m^2/m of row, variant V_2 = 2.72 m^2/m of row, and variant V_3 = 3.63 m^2 /m of row **(tab. 1)**.

The leaf area exposed to direct solar radiation, photosynthetically active at a rate of 100%, did not show variations, being characteristic to the guidance system used in plantation, respectively 2.61 m^2/m of row. At V_1 variant, a deficit of 0.80 m^2/m of row was registered in total leaf area, at V_2 an insignificant leaf excess of 0.11 m^2/ m of row, and at V_3, an important leaf excess of 1.02 m^2/ m row.

The augmentation of the number of shoots and, implicitly, of leaves/vinestock has increased the canopy thickness. The values of *IF leaf index* have shown that at V_1, the foliage exposure space was not totally valorized; atV_2, the space used for the foliage exposure was better valorized; at V_3, because of leaf excess, canopy was thickened and leaves shadowed mutually.

Table 1

Variation of canopy parameters, in connection with the number of shoots/vinestock (Zweigelt variety)

SPECIFICATION	V_1	V_2	V_3
Total leaf area (m^2/m of row)	1.81	2.72	3.63
Exposed leaf area (m^2/m of row)		2.61	
Foliage excess/deficit (m^2 leaves/m of row)	-0.80	+0.11	+1.02
Leaf index (IF)	1.44	0.95	0.71
Foliage exposure degree (%)	100	95	71

The foliage exposure degree to direct solar radiation is of 100% for V_1, 95% for V_2 and 71% for V_3.

2. Grape yield and must quality. By maintaining an identical number of inflorescences/vinestock, the grape yield in experimental variants was: V_1 = 2.40 kg grapes/vinestock, V_2 = 2.50 kg grapes/vinestock and V_3 = 2.58 kg grapes/vinestock **(tab. 2).**

Table 2

Grape yield, content in sugars and anthocyans, and must total acidity (Zweigelt variety)

SPECIFICATION	V_1	V_2	V_3
Grape yield (kg/vinestock)	2.40	2.50	2.58
Must concentration in sugars (g/l)	175	185.1	203.0
Must total acidity (g/l tartaric acid)	6.3	6.8	7.2
Anthocyan content from grape skin (mg/l)	566.45	546.04	537.81

Must concentration in sugars. The analysis of experimental data has shown the positive correlation between total leaf area of vinestocks and must concentration in sugars. The lowest sugar concentration (175 g/l) was obtained at V_1, and the highest one (203 g/l) at V_3. Canopy thickening from variant V_3 did not influence sugars accumulation into grapes **(fig. 1).**

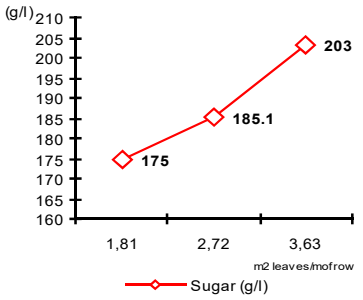

Fig. 1 Corelația dintre suprafața foliară și conținutul mustului în zaharuri

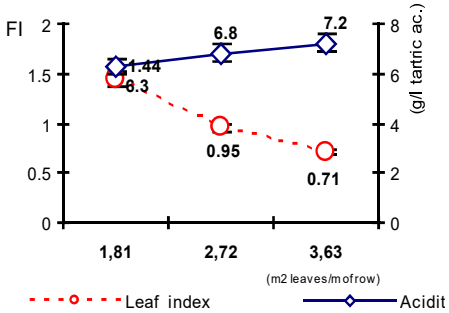

Fig. 2 Correlation between total leaf area, leaf index and must total acidity

Must total acidity. It has increased from variant V_1 to variant V_3, once with the augmentation of total leaf area of vinestocks **(fig. 2)**: at variant V_1, must acidity was of 6.3 g/l tartaric acid and at variant V_2 ,6.8 g/l tartaric acid, and at variant V_3, 7.2 g/l tartaric acid. The increase in must total acidity was caused by the augmentation of canopy thickness, leaves shading and slowing down of the malic acid metabolizing process.

The anthocyans content from grape skin. It diminished once with canopy thickening and shading of vinestock leaf apparatus. The highest anthocyan content (566.45 mg/l must) was registered at variant V_1, with leaves exposure to direct solar radiation of 100% and leaf index with maximum value.

V_3 has achieved the lowest anthocyan content (537.81 mg/L), with a leaf exposure to direct solar radiation of only 71% and a thickened foliage (IF=0.71).

3. Wine quality

Wine alcoholic power **(tab. 3)**. It has increased in relation with must concentration in sugars; the maximum value was registered at variant V_3 (11.29 % vol. alcohol).

Table 3

Wine characteristics (Zweigelt variety)

SPECIFICATION	V_1	V_2	V_3
Wine alcoholic power (% vol. alcohol)	10.51	10.83	11.29
Total dry extract (g/L)	23.7	24.5	27.9
Titrable acidity (g/L tartaric)	5.26	6.48	7.0
Total anthocyans (mg/L)	392.04	346.78	281.56
Malvidine (mg/L)	7.05	8.54	9.87
Cyanidine (mg/L)	14.95	9.76	7.48
Folin Ciocâlteu Index	37	33.83	31.95

Total dry extract. It was positively correlated to the leaf area developed in vinestocks: the lowest value (23.7 g/L) was registered at variant V_1, and the highest one at variant V_3 (27.9 g/L).

Wine total acidity. The influence of thickness on vinestock canopy and diminution in the degree of leaf exposure to direct solar radiation was shown by the analysis of wine titrable acidity. The lowest total acidity (5.26 g/L tartaric acid) was registered at variant V_1, with a maximum foliage exposure to direct solar radiation (100%), and the highest one (7.0 g/L tartaric acid) at variant V_3, with a thickened canopy and less exposed to direct solar radiation (71%).

Wine content in anthocyans. It was strongly influenced by leaf exposure to direct solar radiation. The maximum value of the anthocyan content was registered by variant V_1 (392.04 mg/l), with the best exposure of leaves to direct solar radiation (100%), and the minimum value (281.56 mg/l) by variant V_3, with leaf exposure of only 71%.

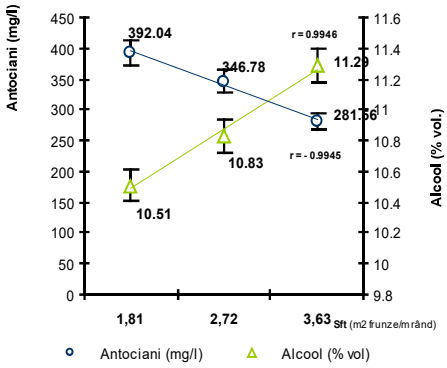

Fig. 3 Correlation between total leaf area, wine alcoholic power and anthocyan content

As concerns the anthocyanic components, we found that *malvidine,* which greatly contributed to the intensity of colour, was positively correlated to total leaf area of the vinestock, while *cyanidine* was negatively correlated to total leaf area and positively correlated to leaf exposure at direct solar radiation.

Wine colour characteristics. The analysis of colour characteristics pointed out that the intensity of wine colour was negatively influenced by thickening and shading of vinestock canopy **(tab. 4**). The wine obtained at variant V_1 has shown the most intense colour (chromaticity 60), and the wine obtained at variant V_3 , the lowest one (chromaticity 54.71).

Table 4

Wine chromatic characteristics (Zweigelt variety)

SPECIFICATION		V_1	V_2	V_3
Clearness		29.2	24.0	23.7
Chromaticity	**a**	60.16	56.07	54.71
	b	36.55	36.44	29.84

CONCLUSIONS

1.In Zweigel variety, with guidance shape of bilateral cordon and training system of vertical monoplane trellis, the optimum value of leaf index is done with 12 shoots/m of row and a total leaf area of 2.72 m^2 /m of row. The canopy, which develops 10 shoots / m of row, does not revaluate the space used by vinestock, for foliage exposure. A number of 20 shoots/m of row determines the canopy thickening.

2. In the absence of some limitative factors, such as canopy thickening and leaves shading, the must concentration in sugars is positively correlated to total leaf area of vinestocks; in Zweigelt variety, the maximum sugars concentration (203 g/l) was registered at a total leaf area of 3.63 m^2/m of row.

3. Must total acidity is increasing once with total leaf area of vinestocks and leaves shading. The highest must total acidity, of 7.2 g/L tartaric acid was registered at variant V_3, at which the foliage was exposed to direct solar radiation, at a rate of only 71%.

4. Canopy thickening determines the accumulation of lower quantities of anthocyans into the grape skin and, implicitly, obtaining less intense coloured wines. The lowest content of anthocyans, of 537.81 mg/l, was registered at variant V_3, with leaf index of 0.71.

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